

CLAIMS

1. An analog electronic timepiece comprising:
 - a driving signal supplying unit configured to generate and supply a reference signal for clocking;
 - 5 an impact detecting unit configured to detect an impact applied externally, based on a counter electromotive force of a step motor that drives hand motion of time hands; and
 - a controlling unit configured to control to drive the
 - 10 step motor using an intermittent driving pulse based on the reference signal supplied from the driving signal supplying unit when the time hands are in a hand-driven state, and to control to brake the step motor when an impact is detected by the impact detecting unit while the time hands are in a
 - 15 non-hand-driven state.
2. The analog electronic timepiece according to claim 1, further comprising a chopper-amplifier unit configured to amplify a counter electromotive force generated by the step
- 20 motor with a predetermined amplification ratio and at a predetermined pulse period when an impact is applied externally to the analog electronic time piece, wherein
- the impact detecting unit is provided with a predetermined threshold, and is configured to detect an
- 25 impact based on whether a signal level amplified by the chopper-amplifier unit at the pulse period exceeds the threshold.
3. The analog electronic timepiece according to claim 2,
- 30 wherein in the chopper-amplifier unit, the pulse period is set to a value corresponding to a weight and a moment of inertia of the time hands.

4. The analog electronic timepiece according to claim 2 or 3, wherein in the chopper-amplifier unit, the pulse period is set to a value corresponding to a power source voltage.

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5. The analog electronic timepiece according to claim 2 or 3, wherein in the chopper-amplifier unit, a chopper-width is set to 30.5 μ s.

10 6. The analog electronic timepiece according to any one of claims 1 to 3, wherein the controlling unit includes a lock pulse output unit configured to control the step motor when the impact is detected, and the lock pulse output unit outputs a lock pulse for a term corresponding to a power
15 source voltage supplied to the step motor.

7. The analog electronic timepiece according to claim 6, wherein the lock pulse output unit is configured to output a continuous pulse having a same phase as that of the
20 driving pulse generated when an impact is applied.

8. The analog electronic timepiece according to claim 7, wherein the lock pulse output by the lock pulse output unit includes at least a lock term for outputting the continuous
25 pulse and a stable section for outputting an inversed pulse after the lock terms has passed.

9. The analog electronic timepiece according to any one of claims 1 to 3, 7, and 8, wherein the controlling unit
30 includes a load compensating unit configured to detect rotation of a rotor based on detection of a counter electromotive force from the pulse motor soon after the output of the driving pulse.

10. The analog electronic timepiece according to any one of claims 1 to 3, 7, and 8, wherein the controlling unit is configured to provide stable terms respectively for
5 starting the rotor of the pulse motor from a stationary stable point thereof before outputting the driving pulse, and for returning the rotor of the pulse motor to the stationary stable point thereof after outputting the driving pulse.

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11. The analog electronic timepiece according to any one of claims 1 to 3, 7, and 8, wherein the impact detecting unit is constituted of inverters that operate based on supply of a source power that is adapted to supply a
15 constant voltage without depending on the power source voltage.

12. The analog electronic timepiece according to claim 9, wherein
20 the impact detecting unit includes an impact detecting resistor configured to detect a counter electromotive force from the pulse motor at the time of the impact, and
the load compensation unit includes a load compensating resistor configured to detect a counter
25 electromotive force from the pulse motor soon after the driving pulse is output.

13. The analog electronic timepiece according to claim 12, wherein the impact detecting resistor has a resistance
30 value set at the minimal resistance value with which the rotation of the pulse motor is detected.

14. The analog electronic timepiece according to claim 12,

wherein setting of the impact detecting resistor is set for each type of timepiece.

15. The analog electronic timepiece according to any one
5 of claims 12 to 14, further comprising a detecting resistor used commonly for the impact detecting resistor and the load compensation resistor, wherein

the impact detecting unit and the load compensating unit are configured to detect an impact and load
10 compensation using the detecting resistor.

16. The analog electronic timepiece according to any one of claims 7, 8, and 12 to 14, wherein the lock pulse output unit is configured to secure an output term of the lock
15 pulse when the lock pulse is input at a time of a logic frequency adjustment executed at predetermined intervals.

17. The analog electronic timepiece according to any one of claims 7, 8, and 12 to 14, further comprising a battery
20 detection controlling unit configured to make the output of the lock pulse precede when the lock pulse is output from the lock pulse output unit at a time of detection of the power source voltage executed at predetermined intervals.

1. (Amended) An analog electronic timepiece comprising:
 - a driving signal supplying unit configured to generate and supply a reference signal for clocking;
 - an amplifying unit configured to amplify a counter electromotive force generated by a step motor that drives hand motions of time hands;
 - an impact detecting unit configured to detect an impact applied externally based on an output signal level of the amplifying unit; and
 - a controlling unit configured to control to drive the step motor using an intermittent driving pulse based on the reference signal supplied from the driving signal supplying unit when the time hands are in a hand-driven state, and to control to brake the step motor when an impact is detected by the impact detecting unit while the time hands are in a non-hand-driven state, wherein

the amplification ratio of the amplifying unit is set to a value that corresponds to at least one of a weight and a moment of inertia of the time hands.
2. (Amended) The analog electronic timepiece according to claim 1, wherein the amplifying unit is a chopper-amplifying unit configured to amplify at the amplification ratio based on a predetermined pulse period, and the predetermined pulse period is set to a value that corresponds to at least one of the weight and the moment of inertia of the time hand.
3. (Amended) The analog electronic timepiece according to claim 2, wherein the predetermined pulse period of the chopper-amplifying means is set further to a value that corresponds to the power source voltage.
4. (Canceled) The analog electronic timepiece according to

claim 2 or 3, wherein in the chopper-amplifier unit, the pulse period is set to a value corresponding to a power source voltage.

5. The analog electronic timepiece according to claim 2 or 3, wherein in the chopper-amplifier unit, a chopper-width is set to 30.5 μ s.

6. (Amended) The analog electronic timepiece according to claim 1 or 2, wherein the controlling unit includes a lock pulse output unit configured to control the step motor when the impact is detected, and the lock pulse output unit outputs a lock pulse for a term corresponding to a power source voltage supplied to the step motor.

7. (Amended) The analog electronic timepiece according to claim 5, wherein the lock pulse output unit is configured to output a continuous pulse having a same phase as that of the driving pulse generated when an impact is applied.

8. (Amended) The analog electronic timepiece according to claim 6, wherein the lock pulse output by the lock pulse output unit includes at least a lock term for outputting the continuous pulse and a stable section for outputting an inversed pulse after the lock terms has passed.

9. (Amended) The analog electronic timepiece according to any one of claims 1, 2, 6 and 7, wherein the controlling unit includes a load compensating unit configured to detect rotation of a rotor based on detection of a counter electromotive force from the pulse motor soon after the output of the driving pulse.

10. (Amended) The analog electronic timepiece according to

any one of claims 1, 2, 6, and 7, wherein the controlling unit is configured to provide stable terms respectively for starting the rotor of the pulse motor from a stationary stable point thereof before outputting the driving pulse, and for returning the rotor of the pulse motor to the stationary stable point thereof after outputting the driving pulse.

11. (Amended) The analog electronic timepiece according to any one of claims 1, 2, 6, and 7, wherein the impact detecting unit is constituted of inverters that operate based on supply of a source power that is adapted to supply a constant voltage without depending on the power source voltage.

12. (Amended) The analog electronic timepiece according to claim 8, wherein

the impact detecting unit includes an impact detecting resistor configured to detect a counter electromotive force from the pulse motor at the time of the impact, and

the load compensation unit includes a load compensating resistor configured to detect a counter electromotive force from the pulse motor soon after the driving pulse is output.

13. (Amended) The analog electronic timepiece according to claim 11, wherein the impact detecting resistor has a resistance value set at the minimal resistance value with which the rotation of the pulse motor is detected.

14. (Amended) The analog electronic timepiece according to claim 11, wherein setting of the impact detecting resistor is set for each type of timepiece.

15. (Amended) The analog electronic timepiece according to any one of claims 11 to 13, further comprising a detecting resistor used commonly for the impact detecting resistor and

the load compensation resistor, wherein

the impact detecting unit and the load compensating unit are configured to detect an impact and load compensation using the detecting resistor.

16. (Amended) The analog electronic timepiece according to any one of claims 6, 7, and 11 to 13, wherein the lock pulse output unit is configured to secure an output term of the lock pulse when the lock pulse is input at a time of a logic frequency adjustment executed at predetermined intervals.

17. (Amended) The analog electronic timepiece according to any one of claims 6, 7, and 11 to 13, further comprising a battery detection controlling unit configured to make the output of the lock pulse precede when the lock pulse is output from the lock pulse output unit at a time of detection of the power source voltage executed at predetermined intervals.